Horseshoe Lake, South Dakota
Summer and Winter Angler Use and Harvest Surveys
December 2007 - August 2011

by

Tyrel S. Moos, Brian G. Blackwell, Ryan J. Braun, Mark J. Ermer,
Todd M. Kaufman and Steve J. Kennedy

South Dakota Department of Game, Fish and Parks
District Office
603 E 8th Ave
Webster, SD 57274

Progress Report

Job Number---------- 2109

Date---------- March 2014

Fisheries, Program Administrator
John Lott

Department Secretary
Jeffrey Vonk

Division Director
Tony Leif

Federal Aid Coordinator
Tanna Zabel

Preface

Information in this report was collected between December 2007 and August 2011. Funding for this project was provided by Federal Aid in Sport Fish Restoration, (D-J) Project F-21-R, Job number 2109. Copies of this report and reference to the data can be made with written permission of the author or Director of the Division of Wildlife, South Dakota Department of Game, Fish and Parks, 523 East Capitol, Pierre, South Dakota, 57501.

The authors would like to acknowledge the interns that assisted with the collection and processing of the data.

Executive Summary

- Horseshoe Lake experienced light to moderate angling pressure during the summers of 2008-2011 and winters of 2007-2008, 2008-2009 and 2009-2010. Winter angling pressure was highly dependent on snowfall due to poor access when snow is abundant. Most anglers were South Dakota residents and most were fishing from boats. Walleye was the most targeted species followed by Smallmouth Bass and Yellow Perch.

- Walleye typically comprised the majority of angler catch and harvest. Smallmouth Bass were frequently captured by anglers and were the most abundant species in the creel during the summer of 2009. Yellow Perch were infrequently caught and comprised a substantial proportion of the creel during the summer of 2010 when abundance and size appealed to anglers.

- Summer angler satisfaction was variable. The majority of anglers indicated they were satisfied during years when walleye catch rates were high. However, the majority of anglers were dissatisfied during the summer of 2009 when walleye catch rates were low. Winter angler satisfaction in 2009-2010 indicated an equal proportion of satisfied and dissatisfied anglers.

- Summer anglers indicated a diversity of factors that are important to consider a fishing trip successful. 'Catching fish' was the most commonly cited response during the summer of 2008. However, 'relaxation' was the most cited response in 2010 and 2011. 'Harvesting fish', 'being with friends' and 'other' were infrequently cited by anglers.

- Anglers indicated strong support for the special panfish regulation in place in northeast South Dakota. Few anglers were opposed to the regulation.

Table of Contents

List of Tables

List of Figures

Horseshoe Lake, South Dakota
Angler Use and Harvest Survey
December 2007 – August 2011

The fishery in Horseshoe Lake is relatively new and is moderately popular with anglers. Increased precipitation in the mid and late 1990's increased the water level and enabled Horseshoe Lake to sustain a sport fishery. Fish stocking began in earnest in 1996 and walleye stocking continues biennially to supplement the fishery. Most species present in Horseshoe Lake are self-sustaining. Walleye are the primary sport fish present in Horseshoe Lake though Smallmouth Bass and Yellow Perch draw anglers seasonally.

The panfish daily limit was changed from 10 to the statewide limit of 15 in 2011. A protected slot limit was established in 2008 for black bass (Smallmouth Bass and Largemouth Bass) from 305 to 457 mm (12-18 inches) with a three fish limit, only one of which may be over 457 mm (18 inches). The regulation was changed in 2009 to conform to the Black Bass Toolbox options (Blackwell and Lucchesi 2009) which allows the harvest of five bass with none between 356 to 457 mm (14-18 inches) and only one may be over 457 mm (18 inches).

Horseshoe Lake has not previously been surveyed for angler use and harvest. Information concerning angler use and harvest is important in the ongoing fisheries management of Horseshoe Lake. This report summarizes summer and winter angler use and harvest surveys that were completed from December 2007 through August 2011.

Study Site

Horseshoe Lake is a meandered lake of moderate size (approximately 243 hectares; 600 acres) located in Day County approximately 24 km (14.9 miles) southwest of the town of Webster. The maximum depth of the lake basin is 8 m (26.2 ft). Much of the land around the lake is private and the shoreline is undeveloped. The state-owned Horseshoe Game Production Area (GPA) lies in the central portion of the lake. Due to the large amount private property along the lake shore, public access is limited to the boat ramp on the GPA along the east shoreline and a township road on the west side of the lake.

Methods

A roving angler use and harvest survey with two-stage stratification was completed during the summers of 2008, 2009, 2010, 2011 and the winters of 2007-2008, 2008-2009 and 2009-2010. The first stratification unit was between weekdays and weekend days. The second stratification unit was for the time periods that the clerk was present. Because weekends typically receive increased fishing pressure most weekend days are represented in the survey. Time periods were randomly assigned to available days with weekdays and weekend/holiday days being treated separately when time periods were assigned.

The survey utilized instantaneous angler counts combined with angler interviews. Instantaneous angler counts provided fishing pressure estimates and angler interviews provided information necessary for estimating fish species catch rates, mean angler trip length, and mean party size. Two instantaneous counts of the total number of boats fishing and all shoreline anglers present were made each surveyed day. When counts were not being made, anglers were contacted and interviewed. Angler use and harvest estimates were calculated using Creel Application Software (CAS; Soupir and Brown 2002).

Additional questions asked during interviews were used to obtain angler primary residence, fish species targeted, and angler opinions. Total length (TL; mm) measurements from angler caught fish were recorded during the interview process.

The potential economic value of the Horseshoe Lake fishery was estimated by multiplying a daily expenditure of $50 (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce, Bureau of Census 2011) times the estimated number of angler days.

Results and Discussion

Angler Target Species

A small proportion of anglers interviewed during the summer (≤6% for all summers; Table 1) indicated no preference for target species. Of those anglers that indicated a preference, Walleye was the primary target species. The proportion of anglers targeting Walleye ranged from a low of 50% (2011) to a high of 96% (2010; Table 1). Yellow Perch and Smallmouth Bass were the only other species targeted by anglers interviewed during the summer periods (Table 1). Yellow Perch are typically targeted when their population abundance and size structure are high. Smallmouth Bass attracted light to moderate interest from anglers during the summer with proportions of anglers targeting them ranging from 0% (2010) to 31% (2011; Table 1).

A moderate proportion of anglers interviewed during the winter (19% to 40%; Table 2) indicated no preference for target species. Of those anglers that indicated a preference, Walleye was their primary target species with proportions ranging from 45% (2007-2008) to 75% (2008-2009; Table 2). Yellow Perch was the only other species targeted and were most heavily targeted during the winter of 2007-2008 by 36% of anglers (Table 2).

Fishing Pressure

Summer angling pressure was relatively consistent each summer period ranging from 6,100 (2011) to 8,476 angler hours (2010; Table 3). Mean party size ranged from 2.08 (2011) to 2.44 (2008; Table 3) anglers. Mean trip length ranged from 3.46 (2008) to 5.67 hours (2011) with trip length increasing each year of the summer creel survey (Table 3). Increases observed in overall trip length corresponded to increased Walleye catch rates during 2010 and 2011. Average size of Walleye harvested decreased in 2010 and 2011 likely indicating anglers had to sort more small fish to catch larger fish which may explain the increased trip length during those years. Most angler hours are attributed to anglers fishing from boats with proportions greater than 99% for all surveyed years (Table 3). The low proportion of shore anglers is likely due to the lack of public access to most of the lake shore.

Winter access into Horseshoe Lake can be very difficult after heavy snowfall events and likely influenced variability of angling pressure, party size and trip length. Winter angling pressure was highly variable ranging from 493 (2009-2010) to 3,310 angler hours (2007-2008; Table 4). Party size ranged from 1.65 (2008-2009) to 2.94 anglers (2009-2010; Table 4). Overall trip length ranged from 2.37 (2008-2009) to 4.67 hours (2009-2010; Table 4). The overall proportion of angler hours attributed to fishing from ice shacks ranged from 41% (2009-2010) to 57% (2008-2009; Table 4) and likely varies with weather conditions.

Angler Demographics

South Dakota residents comprised a large proportion of the anglers fishing at Horseshoe Lake with overall percentage ranging from 58% (2009) to 89% (2010; Table 3). Home residence of winter anglers was almost exclusively South Dakota (>92% of anglers for all winters; Table 4). Nonresident anglers utilizing Horseshoe Lake during the summer were from Iowa, Minnesota and Nebraska. Nonresident anglers fishing Horseshoe Lake during the winter 2007-2008 were from Iowa, Minnesota, Nebraska and Wisconsin. No nonresident anglers fished Horseshoe Lake during the winters of 2008-2009 and 2009-2010.

Angler Catch and Harvest

Northern Pike

Summer Northern Pike catch and harvest rates were low. Overall catch rates ranged from 0.01 (2008) to 0.15 Northern Pike per hour (2011; Table 7). The estimated number of Northern Pike caught ranged from 32 (2008) to 914 (2011; Table 9). Overall harvest rates were low with estimates ≤ 0.01 Northern Pike per hour for all summers surveyed (Table 7). Estimates for harvest of Northern Pike ranged from 0 (2008) to 114 (2010; Table 9). Few Northern Pike were harvested precluding length frequency analysis.

Winter Northern Pike catch rates were relatively low but harvest rates were higher than those observed during summer. Overall catch rates ranged from 0.03 (2007-2008) to 0.26 Northern Pike per hour (2009-2010; Table 8). The estimated number of Northern Pike caught ranged from 21 (2008-2009) to 141 (2007-2008; Table 10). Harvest rates were higher during the winter surveys ranging from 0.01 (2008-2009) to 0.25 Northern Pike per hour (2009-2010; Table 8). The estimated number of harvested Northern Pike ranged from 10 (2008-2009) to 123 (2009-2010; Table 10). Northern Pike were infrequently caught during the winter and few harvested Northern Pike were measured precluding length frequency analysis.

Smallmouth Bass

Overall summer Smallmouth Bass catch rates ranged from 0.08 (2010) to 0.24 fish per hour (2011; Table 7). The estimated catch of Smallmouth Bass ranged from 671 (2010) to 1,481 fish (2011; Table 9). Harvest rates were relatively low (≤0.02 for all years; Table 7) and total estimated harvest was <100 for all years (Table 9). Few Smallmouth Bass were harvest precluding length frequency analysis.

Winter Smallmouth Bass catch and harvest was low. Overall catch rates were ≤0.02 fish per hour and harvest rates were <0.01 fish per hour for all winters surveyed (Table 8). Few Smallmouth Bass were harvest precluding length frequency analysis.

Walleye

Summer Walleye catch and harvest rates were variable. Overall catch rates ranged from 0.11 (2009) to 0.86 Walleye per hour (2011) while overall harvest rates ranged from 0.05 (2009) to 0.24 Walleye per hour (2011; Table 7). The estimated total number of Walleye caught ranged from 710 (2009) to 5,274 (2011; Table 9). Total harvest estimates ranged from 306 (2009) to 1,929 Walleye (2010; Table 9).

Mean TL of harvested Walleye decreased over the four summers surveyed. Mean total length during 2010 and 2011 was 396 and 390 mm, respectively (Figure 1). However, that was a substantial decrease from the observed mean total length of 433 and 531 mm in 2008 and 2009, respectively (Figure 1). Walleye >600 mm comprised a moderate to substantial proportion of harvested Walleye during 2008 and 2009 but few Walleye of this size were observed during 2010 and 2011. This could be related to a change in the population size structure due to natural mortality and/or angler harvest.

Winter Walleye overall catch rates ranged from 0.03 (2008-2009) to 0.19 Walleye per hour (2009-2010; Table 8). Harvest rates ranged from <0.01 (2008-2009) to 0.19 Walleye per hour (2009-2010; Table 8). The estimated total number of Walleye caught ranged from 26 (2008-2009) to 344 (2007-2008; Table 10). The estimated total harvest of Walleye ranged from 3 (2008-2009) to 235 (2007-2008; Table 10). Walleye were inconsistently caught during the winter and few were measured precluding length frequency analysis.

Yellow Perch

Overall summer angler catch rates of Yellow Perch were low (≤0.05 fish per hour; Table 7) three of four years surveyed. When Yellow Perch are abundant, angling pressure and catch rates are high. This occurred during the summer of 2011 with an overall catch rate for Yellow Perch of 0.50 fish per hour (Table 7). Overall Yellow Perch catch estimates ranged from 0 (2009) to 3,035 fish (2011; Table 7). Overall harvest rates ranged from <0.01 (2008) to 0.16 fish per hour (2011; Table 7). Overall Yellow Perch harvest estimates ranged from 9 (2008) to 1,002 fish (2011; Table 9). Yellow Perch were infrequently observed during angler interviews during the summer precluding length frequency analysis.

Yellow Perch winter angler catch and harvest rates were variable. Overall catch rates ranged from 0.00 (2009-2010) to 0.29 Yellow Perch per hour (2007-2008; Table 8). Low numbers of Yellow Perch were caught with overall Yellow Perch catch estimates ranging from 0 (2009-2010) to 970 (2007-2008; Table 10). During winter periods overall harvest rates ranged from 0.00 (2008-2009) to 0.08 Yellow Perch per hour (2007-2008; Table 8). Overall Yellow Perch harvest estimates ranged from 0 (2008-2009) to 267 (2007-2008; Table 10). Yellow Perch harvest was low during the winter precluding length frequency analysis.

Other species

Other species reported in low numbers during the summer and winter angler surveys include: Black Crappie, Bluegill and Largemouth Bass.

Angler Opinions

Angler Satisfaction

During the summers of 2008-2011 and the winter of 2009-2010 anglers were asked to quantify angling satisfaction considering all factors. The question was changed after the summer of 2008 to include moderately satisfied and moderately dissatisfied. Overall summer angler satisfaction varied substantially ranging from 31.8% (2009) to 87.5% (2011; Table 11) of interviewed anglers. Angler dissatisfaction ranged from 12.6% (2011) to 45.4% (2009; Table 11). Low satisfaction during the summer of 2009 corresponds to the lowest catch rate of Walleye observed during this survey. Similarly, the high satisfaction observed during the summer of 2011 parallels the highest Walleye catch rate. Both angler satisfaction and dissatisfaction were 40% during the winter of 2009-2010 (Table 11).

Angling Trip Success

During the summers of 2008, 2010 and 2011 anglers were asked what the most important factor was to consider a fishing trip successful. Angler responses varied by year. In 2008 'catching fish' was cited by approximately 43% of interviewed anglers while 'relaxation' and 'harvesting fish' comprised 26% and 16% of responses, respectively (Table 12). However, 'relaxation' was the most cited factor by anglers in 2010 and 2011 with 33% and 38%, respectively (Table 12). It is interesting to note that anglers indicated 'relaxation' as the most important factor during the summers of 2010 and 2011 when walleye catch rates were high and conversely indicated 'catching fish' during the summer of 2008 when walleye catch rates were low.

Northeast South Dakota Panfish Regulation

During the summer of 2009 and winter of 2009-2010 anglers were asked whether they are in favor of or oppose the special panfish regulation in northeast South Dakota. Most anglers (86% in 2009 and 80% in 2009-2010; Table 13) indicated they were in favor of the special regulation. Few anglers (5% in 2009 and 0% in 2009-2010; Table 13) indicated they were opposed to the regulation.

Table 1. Angler primary target species (percentage) by month and overall for anglers fishing Horseshoe Lake, South Dakota during the summers of 2008-2011. ANY=anything, SMB=Smallmouth Bass, WAE=Walleye, YEP=Yellow Perch.

		Percent (%) of Anglers			
Year	Month	ANY	SMB	WAE	YEP
2008	May	0.0	9.1	90.9	0.0
	June	0.0	0.0	100.0	0.0
	July	0.0	0.0	100.0	0.0
	August	0.0	8.3	83.3	8.3
	Overall	0.0	4.8	92.9	2.4
2009	May	0.0	23.5	76.5	0.0
	June	0.0	6.3	93.8	0.0
	July	0.0	0.0	100.0	0.0
	August	0.0	33.3	66.7	0.0
	Overall	0.0	15.8	84.2	0.0
2010	May	0.0	0.0	100.0	0.0
	June	0.0	0.0	100.0	0.0
	July	4.2	0.0	95.8	0.0
	August	10.0	0.0	90.0	0.0
	Overall	4.4	0.0	95.6	0.0
2011	May	0.0	42.9	57.1	0.0
	June	0.0	50.0	50.0	0.0
	July	33.3	33.3	33.3	0.0
	August	0.0	0.0	50.0	50.0
	Overall	6.3	31.3	50.0	12.5

Table 2. Overall angler primary target species (percentage) for anglers fishing Horseshoe Lake, South Dakota during the winters of 2007-2008, 2008-2009 and 2009-2010. ANY=anything, WAE=Walleye, YEP=Yellow Perch.

	Percent (%) of Anglers		
Year	ANY	WAE	YEP
2007-2008	19.4	44.8	35.8
2008-2009	18.8	75.0	6.2
2009-2010	40.0	60.0	0.0

Table 3. Angler demographics by month and overall including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; $), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Horseshoe Lake, South Dakota during the summers of 2008-2011. One standard error is provided in parentheses when calculated.

Year	Month	# interviews	Angler hours	Angler days	Eco value ($)	Trip length (hr)	Party size	% SD	% Boat or Shack
2008	May	11	2,003 (790)	561	28,059	3.57 (---)	2.17 (---)	90.2	97.5
	June	12	998 (411)	436	21,782	2.29 (---)	2.22 (---)	66.7	100.0
	July	7	1,444 (703)	329	16,449	4.39 (---)	2.95 (---)	71.4	100.0
	August	12	1,757 (314)	495	24,749	3.55 (---)	2.41 (---)	91.7	100.0
	Overall	42	6,202 (1,177)	1,793	89,629	3.46 (---)	2.44 (---)	87.5	100.0
2009	May	17	3,499 (1,321)	769	38,447	4.55 (---)	1.49 (---)	75.0	98.4
	June	16	1,614 (741)	355	17,733	4.55 (---)	2.37 (---)	43.8	100.0
	July	2	1,056 (740)	349	17,427	3.03 (---)	3.00 (---)	50.0	100.0
	August	3	293 (150)	110	5,481	2.67 (---)	2.29 (---)	33.3	100.0
	Overall	38	6,461 (1,692)	1,603	80,164	4.03 (---)	2.13 (---)	57.9	99.2
2010	May	5	1,774 (789)	447	22,340	3.97 (---)	3.39 (---)	100.0	97.7
	June	6	1,208 (460)	195	9,742	6.20 (---)	1.37 (---)	83.3	100.0
	July	24	4,212 (704)	893	44,623	4.72 (---)	2.37 (---)	100.0	100.0
	August	10	1,281 (487)	302	15,075	4.25 (---)	2.40 (---)	60.0	100.0
	Overall	45	8,476 (1,252)	1,875	93,756	4.52 (---)	2.39 (---)	88.9	99.5

Table 3. Continued.

Year	Month	# interviews	Angler hours	Angler days	Eco value ($)	Trip length (hr)	Party size	% SD	% Boat or Shack
2011	May	7	1,469 (205)	252	12,601	5.83 (---)	1.61 (0.00)	71.4	97.5
	June	2	1,494 (164)	236	11,801	6.33 (---)	2.00 (---)	100.0	100.0
	July	3	1,802 (402)	372	18,611	4.84 (---)	2.67 (---)	33.3	100.0
	August	4	1,335 (652)	240	12,004	5.56 (---)	2.50 (---)	100.0	100.0
	Overall	16	6,100 (810)	1,076	53,788	5.67 (---)	2.08 (0.00)	75.0	99.4

Table 4. Overall angler demographics including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; $), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Horseshoe Lake, South Dakota during the winters of 2007-2008, 2008-2009 and 2009-2010. One standard error is provided in parentheses when calculated.

Year	# interviews	Angler hours	Angler days	Eco value ($)	Trip length (hr)	Party size	% SD	% Boat or Shack
2007-2008	67	3,310 (692)	1,373	68,672	2.41 (0.21)	1.72 (0.19)	92.5	51.2
2008-2009	16	801 (220)	338	16,895	2.37 (---)	1.65 (---)	100.0	57.2
2009-2010	5	493 (235)	106	5,276	4.67 (---)	2.94 (---)	100.0	40.9

Table 5. State residence (percentage) of anglers fishing Horseshoe Lake, South Dakota during the summers of 2008-2011.

	Percent (%) of anglers			
State	2008	2009	2010	2011
South Dakota	81.0	57.9	88.9	75.0
Iowa	11.9	18.4	8.9	18.7
Minnesota	0.0	23.7	0.0	0.0
Nebraska	7.1	0.0	2.2	6.3

Table 6. State residence (percentage) of anglers fishing Horseshoe Lake, South Dakota during the winters of 2007-2008, 2008-2009 and 2009-2010.

	Percent (%) of anglers		
State	2007-2008	2008-2009	2009-2010
South Dakota	92.5	100	100
Iowa	1.5	0.0	0.0
Minnesota	1.5	0.0	0.0
Nebraska	3.0	0.0	0.0
Wisconsin	1.5	0.0	0.0

Table 7. Estimated monthly and total catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE) and Yellow Perch (YEP) at Horseshoe Lake, South Dakota during the summers of 2008-2011. One standard error is provided in parentheses when calculated.

		NOP		SMB		WAE		YEP	
Year	Month	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2008	May	0.00 (0.00)	0.00 (0.00)	0.08 (0.05)	0.00 (0.00)	0.05 (0.05)	0.04 (0.03)	0.00 (0.00)	0.00 (0.00)
	June	0.01 (0.01)	0.00 (0.00)	0.03 (0.02)	0.00 (0.00)	0.15 (0.11)	0.11 (0.08)	0.01 (0.01)	0.01 (0.01)
	July	0.00 (0.00)	0.00 (0.00)	0.27 (0.14)	0.00 (0.00)	0.67 (0.46)	0.38 (0.22)	0.00 (0.00)	0.00 (0.00)
	August	0.01 (0.02)	0.00 (0.00)	0.31 (0.18)	0.05 (0.05)	0.18 (0.07)	0.06 (0.04)	0.01 (0.02)	0.00 (0.00)
	Overall	0.01 (0.01)	0.00 (0.00)	0.18 (0.06)	0.02 (0.02)	0.25 (0.08)	0.14 (0.04)	0.01 (0.01)	<0.01 (<0.01)
2009	May	0.02 (0.02)	0.01 (0.01)	0.22 (0.13)	0.01 (0.01)	0.16 (0.11)	0.07 (0.06)	0.00 (0.00)	0.00 (0.00)
	June	0.02 (0.01)	0.02 (0.01)	0.04 (0.05)	0.00 (0.00)	0.07 (0.09)	0.03 (0.04)	0.00 (0.00)	0.00 (0.00)
	July	0.00 (0.00)	0.00 (0.00)	0.04 (0.05)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	August	0.08 (---)	0.04 (---)	0.57 (---)	0.00 (0.00)	0.08 (---)	0.08 (---)	0.00 (0.00)	0.00 (0.00)
	Overall	0.02 (0.01)	0.01 (<0.01)	0.16 (0.07)	0.01 (<0.01)	0.11 (0.05)	0.05 (0.03)	0.00 (0.00)	0.00 (0.00)

Table 7. Continued.

		NOP		SMB		WAE		YEP	
Year	Month	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2010	May	0.11 (0.14)	0.00 (0.00)	0.02 (0.02)	0.00 (0.00)	0.19 (0.09)	0.15 (0.07)	0.03 (---)	0.03 (---)
	June	0.07 (0.04)	0.07 (0.04)	0.10 (0.05)	0.00 (0.00)	0.21 (0.19)	0.14 (0.16)	0.01 (0.01)	0.01 (0.01)
	July	0.02 (0.03)	0.01 (0.01)	0.08 (0.04)	0.01 (<0.01)	0.67 (0.27)	0.34 (0.10)	0.08 (0.05)	0.04 (0.02)
	August	0.04 (0.05)	0.00 (0.00)	0.15 (0.13)	0.00 (0.00)	0.29 (0.15)	0.06 (0.03)	0.01 (0.01)	0.01 (0.01)
	Overall	0.05 (0.03)	0.01 (0.01)	0.08 (0.03)	<0.01 (<0.01)	0.44 (0.14)	0.23 (0.07)	0.05 (0.03)	0.03 (0.01)
2011	May	0.48 (0.10)	0.05 (0.04)	0.73 (0.10)	0.00 (0.00)	0.36 (0.06)	0.11 (0.03)	0.00 (0.00)	0.00 (0.00)
	June	0.04 (0.03)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.79 (---)	0.16 (---)	0.10 (---)	0.04 (0.03)
	July	0.07 (0.05)	0.00 (0.00)	0.14 (0.21)	0.02 (0.03)	0.61 (0.23)	0.41 (0.17)	0.13 (0.09)	0.13 (0.09)
	August	0.01 (0.01)	0.00 (0.00)	0.12 (0.19)	0.00 (0.00)	1.85 (3.26)	0.27 (0.29)	1.99 (3.43)	0.54 (0.53)
	Overall	0.15 (0.03)	0.01 (0.01)	0.24 (0.09)	0.01 (0.01)	0.86 (0.59)	0.24 (0.09)	0.50 (0.57)	0.16 (0.09)

Table 8. Estimated overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE) and Yellow Perch (YEP) at Horseshoe Lake, South Dakota during the winters of 2007-2008, 2008-2009 and 2009-2010. One standard error is provided in parenthesis when calculated.

	NOP		SMB		WAE		YEP	
2007-2008	0.04 (0.02)	0.02 (0.01)	<0.01 (0.01)	0.00 (0.00)	0.10 (0.07)	0.07 (0.05)	0.29 (0.29)	0.08 (0.08)
2008-2009	0.03 (0.03)	0.01 (0.02)	0.02 (0.02)	<0.01 (<0.01)	0.03 (0.03)	<0.01 (<0.01)	0.16 (0.04)	0.00 (0.00)
2009-2010	0.26 (0.12)	0.25 (0.12)	0.00 (0.00)	0.00 (0.00)	0.19 (0.09)	0.19 (0.09)	0.00 (0.00)	0.00 (0.00)

Table 9. Estimated monthly and overall catch and harvest of Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE), Yellow Perch (YEP) and total at Horseshoe Lake, South Dakota during summers of 2008-2011. One standard error is provided in parenthesis when calculated.

		NOP		SMB		WAE		YEP		Total	
Year	Month	C	H	C	H	C	H	C	H	C	H
2008	May	0 (0)	0 (0)	160 (74)	0 (0)	102 (54)	80 (29)	0 (0)	0 (0)	262 (94)	80 (29)
	June	9 (7)	0 (0)	26 (22)	0 (0)	145 (62)	111 (43)	9 (12)	9 (12)	187 (89)	119 (48)
	July	0 (0)	0 (0)	390 (59)	0 (0)	973 (307)	555 (87)	0 (0)	0 (0)	1,363 (345)	555 (87)
	August	24 (29)	0 (0)	542 (321)	95 (96)	321 (115)	113 (77)	24 (29)	0 (0)	951 (447)	208 (123)
	Overall	32 (29)	0 (0)	1,118 (336)	95 (96)	1,541 (338)	858 (127)	32 (31)	9 (12)	2,769 (580)	962 (161)
2009	May	70 (31)	18 (21)	775 (135)	52 (23)	576 (150)	227 (134)	0 (0)	0 (0)	1,421 (279)	297 (160)
	June	26 (7)	26 (7)	66 (34)	0 (0)	110 (77)	55 (40)	0 (0)	0 (0)	257 (159)	81 (44)
	July	0 (0)	0 (0)	40 (48)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40 (48)	0 (0)
	August	24 (---)	12 (---)	166 (---)	0 (---)	24 (---)	24 (---)	0 (0)	0 (0)	214 (---)	36 (---)
	Overall	120 (32)	55 (23)	1,047 (147)	52 (23)	710 (168)	306 (140)	0 (0)	0 (0)	1,932 (324)	414 (166)

Table 9. Continued.

		NOP		SMB		WAE		YEP		Total	
Year	Month	C	H	C	H	C	H	C	H	C	H
2010	May	188 (224)	0 (0)	31 (26)	0 (0)	335 (75)	273 (0)	45 (---)	45 (---)	601 (274)	318 (0)
	June	89 (27)	89 (27)	119 (34)	0 (0)	258 (183)	174 (169)	10 (9)	10 (9)	475 (238)	273 (192)
	July	97 (50)	26 (26)	325 (143)	26 (15)	2,804 (796)	1,411 (436)	322 (206)	164 (92)	3,548 (885)	1,627 (458)
	August	54 (67)	0 (0)	196 (132)	0 (0)	366 (131)	71 (25)	18 (10)	18 (10)	633 (250)	89 (33)
	Overall	427 (241)	114 (37)	671 (199)	26 (15)	3,764 (830)	1,929 (468)	395 (206)	238 (93)	5,257 (988)	2,307 (497)
2011	May	709 (78)	70 (67)	1,068 (23)	0 (0)	524 (28)	154 (28)	0 (0)	0 (0)	2,301 (97)	224 (51)
	June	59 (46)	0 (0)	0 (0)	0 (0)	1,175 (426)	235 (---)	147 (---)	59 (---)	1,381 (379)	294 (61)
	July	129 (83)	0 (0)	259 (302)	32 (46)	1,100 (648)	744 (480)	227 (146)	227 (146)	1,715 (645)	1,003 (586)
	August	17 (12)	0 (0)	154 (164)	0 (0)	2,474 (2,937)	358 (222)	2,662 (3,067)	717 (425)	5,323 (6,163)	1,075 (645)
	Overall	914 (124)	70 (67)	1,481 (344)	32 (46)	5,274 (3,038)	1,492 (529)	3,035 (3,070)	1,002 (455)	10,721 (6,209)	2,596 (875)

Table 10. Estimated overall catch and harvest of Northern Pike (NOP), Smallmouth Bass (SMB), Walleye (WAE), Yellow Perch (YEP) and total at Horseshoe Lake, South Dakota during the winters of 2007-2008, 2008-2009 and 2009-2010. One standard error is provided in parenthesis when calculated.

	NOP		SMB		WAE		YEP		Total	
Year	C	H	C	H	C	H	C	H	C	H
2007-2008	141 (69)	52 (25)	13 (28)	0 (0)	344 (153)	235 (122)	970 (545)	267 (201)	1,467 (616)	553 (248)
2008-2009	21 (20)	10 (13)	13 (13)	3 (0)	26 (15)	3 (0)	128 (0)	0 (0)	187 (34)	16 (13)
2009-2010	123 (0)	123 (0)	0 (0)	0 (0)	92 (0)	92 (0)	0 (0)	0 (0)	220 (0)	215 (0)

Table 11. Horseshoe Lake, South Dakota angler responses (percentage of total) during the summers of 2008-2011 and winter of 2009-2010 to the question: "Considering all factors, how satisfied are you with your fishing trip today?" N is the number of responses. During the summer of 2008 (*) moderately satisfied and moderately dissatisfied were not options for angler response.

	Percent (%)					
Response	2008* N=42	2009 N=22	2010 N=45	2011 N=16		2009-2010 N=5
Very Satisfied	38.1	13.6	26.7	62.5		20.0
Moderately Satisfied	———	4.6	22.2	25.0		20.0
Slightly Satisfied	28.6	13.6	8.9	0.0		0.0
Neutral	16.7	22.7	11.1	0.0		20.0
Slightly Dissatisfied	14.3	18.2	15.6	6.3		0.0
Moderately Dissatisfied	———	13.6	11.1	6.3		40.0
Very Dissatisfied	2.4	13.6	4.4	0.0		0.0

Table 12. Horseshoe Lake, South Dakota angler response (percentage of total) during the summers of 2008, 2010 and 2011 to the question: "What is the most important factor to you in defining a successful fishing trip?" N is the number of responses.

	Percent (%)		
Response	2008 N=42	2010 N=45	2011 N=16
Relaxation	26.2	33.3	37.5
Harvesting Fish	16.7	4.4	12.5
Participate	2.4	13.3	0.0
Catching Fish	42.9	22.2	12.5
Being with Friends	11.9	20.0	0.0
Other	0.0	6.7	37.5

Table 13. Horseshoe Lake, South Dakota angler response (percentage of total) during the summer of 2009 and winter of 2009-2010 to the question: "Are you in favor of the reduced panfish limits in northeast South Dakota?" N is the number of responses.

	Percent (%)		
Response	2009 N=21		2009-2010 N=5
Yes	85.7		80
No Opinion	9.5		20
No	4.8		0

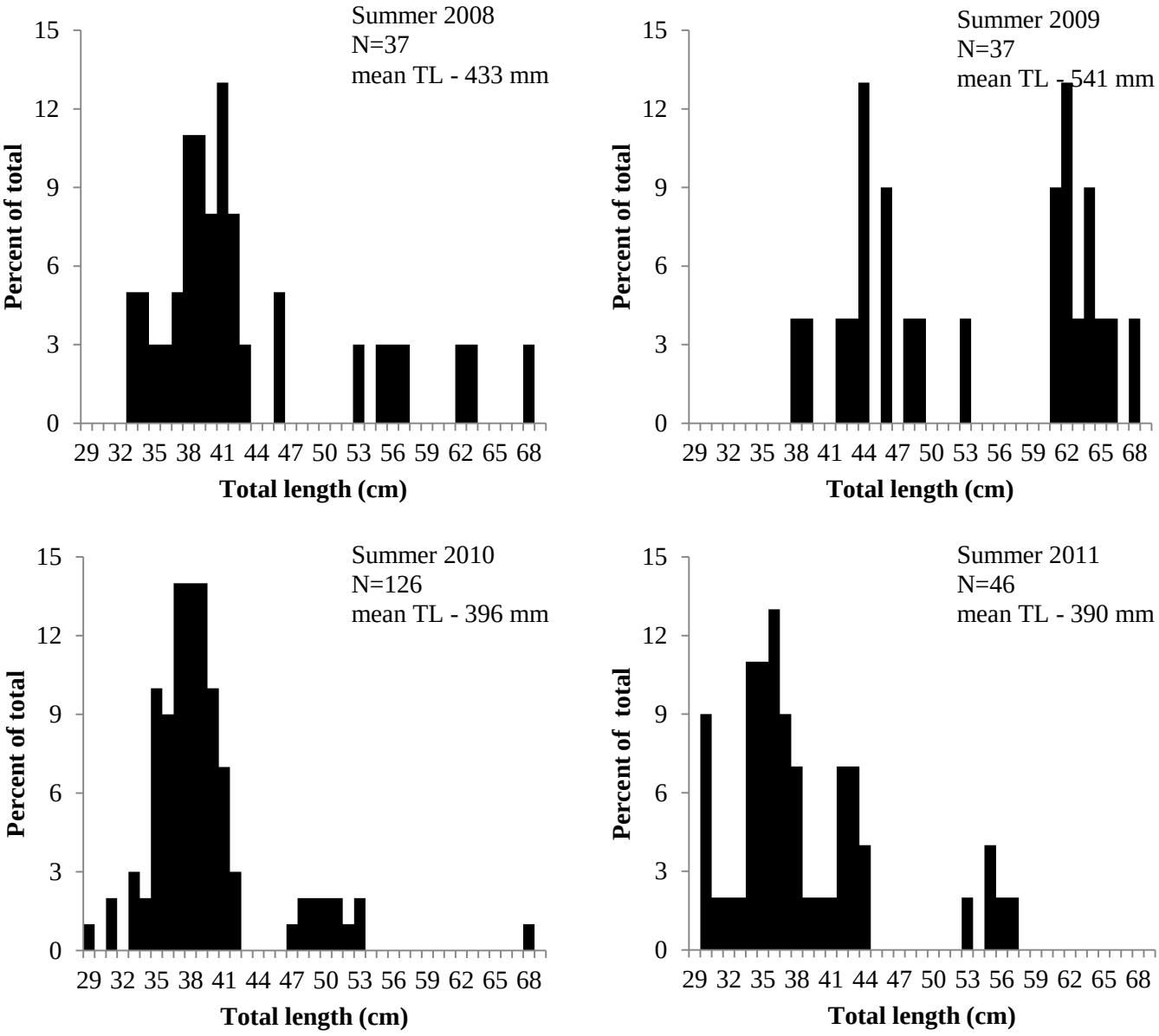

Figure 1. Length frequency histogram of Walleye harvested by anglers fishing Horseshoe Lake during the summers of 2008-2011. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Walleye.

References

Blackwell, B. G., and D. O. Lucchesi. 2009. South Dakota black bass toolbox. South Dakota Department of Game Fish and Parks, Completion Report 09-03, Pierre.

Soupir, C.A., and M.L. Brown. 2002. Comprehensive evaluation and modification of the South Dakota angler creel program. South Dakota Department of Game, Fish and Parks, Completion Report 02-10, Pierre.

United States Department of the Interior, Fish and Wildlife Service and United States Department of Commerce, Bureau of the Census. 2011. 2011 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Government Printing Office, Washington, D.C.